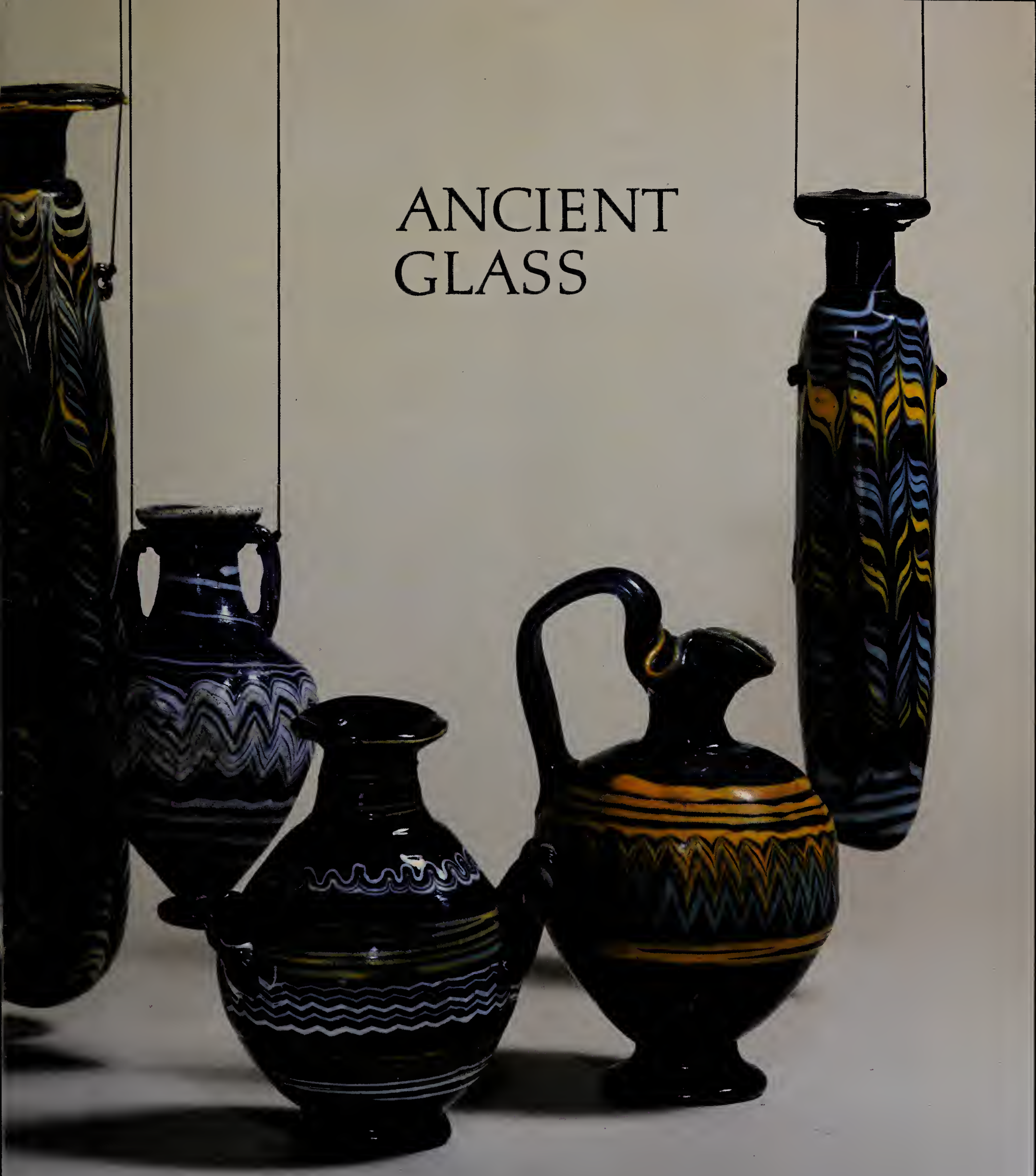
ANCIENT GLASS



Museum News The Toledo Museum of Art

FOREWORD

Of the Museum's great collection of glass, probably the best known part is its remarkable range of wares from the ancient world. This is notable for its broad representation of pieces from almost every period of antiquity, beginning in the 2nd millenium B.C. with the cultures of ancient Egypt and Mesopotamia, and extending through the Hellenistic and Roman eras to the establishment of the Byzantine and Islamic empires in the 6th-8th centuries A.D. The collection is also extraordinary in exhibiting an exceptionally wide range of forms, decorative styles, and manufacturing techniques. To study such a rich collection permits one a rare opportunity for understanding the ancient glassmakers' art.

This issue is devoted to introducing ancient glass and to relating it to other art forms in the ancient world. The article in this issue, illustrated by selected examples from the collection, is by David Grose, the Museum's Curator of Glass until 1977. He is now a member of the Department of Classics at the University of Massachusetts, Amherst, and is a scholar who has specialized in ancient glass. His new attributions and dating of many pieces in the Museum's collection in large part reflect his personal archaeological experience. His continuing interest in the Museum has made this publication possible, and for this we are grateful. We also wish to thank Diana Attie Seeman for her skilled drawing after the engraved beaker on page 19.

The majority of the ancient glass in the Museum's collection was assembled by Thomas E. H. Curtis of Plainfield, New Jersey. Curtis acquired it from the art market around the turn of the century. In 1919 Edward Drummond Libbey bought the entire collection for the Museum from the Curtis estate, although it was not accessioned until 1923. In the years since, many other important pieces have been purchased with funds bequeathed by Mr. Libbey.

Primary examples of ancient glass are shown in the Art in Glass Gallery in a sequence beginning with glass from 18th Dynasty Egypt and continuing through Roman glass made prior to the Islamic period. Further, several hundred pieces displayed by type are available for viewing in the Glass Study Room. Full catalogue information and study topics of interest are also available there for general public use. We hope that this issue will serve as an introduction to the ancient art of glassmaking as well as an invitation to come to the Museum and personally see this remarkable collection.

Roger Mandle, *Director*

Cover: **Core-formed vessels,** Eastern Mediterranean, Pre-Hellenistic or Hellenistic, 6th-1st centuries B.C. (left to right) **Amphora,** H. 4¾ in. (12 cm), 23.95. Oinochoe, H. 5-5/16 in. (15.1 cm), 23.152. **Alabastron,** H. 7¾ in. (19.7 cm), 67.3. **Amphora,** H. 3½ in. (8.9 cm), 23.168. **Stamnos,** H. 3⅜ in. (8.5 cm), 23.128. **Oinochoe,** H. 4-5/16 in. (11 cm), 23.89. **Alabastron,** H. 5⅞ in. (14.9 cm), 23.163.

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The glass industry is almost as old as civilization itself. It was established because of the striking aesthetic properties of glass. These properties were immediately recognized and exploited, at first to enhance the beauty of other objects as insets for jewelry, inlays for furnishings, or as colorful accents in architecture. Later, glass was used to form vessels, first as containers, then as tableware.

The artistic properties of glass that attracted the ancients are those that attract us today: clarity, transparency, brilliant color, and optical effects. Ancient glassmakers skillfuly explored all of these possibilities. Indeed, they discovered and developed almost all of the techniques still used today for making and decorating glass.

The collection of The Toledo Museum of Art reflects the development of the ancient industry for over 2,000 years, from about 1450 B.C. to 650 A.D. In all, the collection comprises 1,300 pieces of ancient glass extending from 18th Dynasty Egypt to the Dark Ages in western Europe and the early Byzantine era in the eastern Mediterranean. As such, it represents one of the most comprehensive collections in the United States or Europe.

In addition to breadth, the collection possesses three areas of unusual strength: pre-Hellenistic and Hellenistic core-formed bottles, Hellenistic and Roman cast glass, and Syro-Palestinian glass generally. The core-made bottles, 127 in number, reflect almost every shape and decorative style manufactured during the 6th to 1st centuries B.C. (Cover). The Hellenistic and Roman cast vessels, mostly bowls, cups and bottles, illustrate the rich variety of glassware produced during the 2nd and 1st centuries B.C. and early 1st century A.D. Much of it is monochrome (Figs. 9 and 13), but the most striking vessels are cast in mosaic glass (Figs. 7, 11-12). In addition to intact pieces, the collection contains over 1,000 fragments of mosaic glass vessels and another 100 cast glass gemstones and inlays. Cameo glass is represented by an additional 100 plaques, medallions (Fig. 23) and fragmentary vessels.

The third area of strength is glass produced by the workshops of ancient Syria and Palestine—modern Lebanon, Israel and Jordan. Many of the cast pieces and most of the collection's blown and mold-blown glass come from this region. In many respects the collection closely mirrors eight centuries of the Syro-Palestinian glass industry, from 150 B.C. to 650 A.D.

TECHNIQUES AND COLORS

The three essential ingredients of ancient glass are silica obtained from sand, lime, and an alkali such as soda or potash. When heated to about 2500 degrees F., the raw materials melt and fuse to form glass which can then be fashioned into vessels or other objects.

Until discovery of the blow pipe, glass vessels were made in three principal ways. The earliest was the core technique in which the glassmaker formed a removable core of mud or clay in the shape of the desired vessel around a metal rod. Hot glass was then trailed onto the core to form the body of the vessel. The surface was smoothed by rolling or "marvering" the vessel on a flat stone slab. Decoration was also trailed on and often dragged with a pointed tool into feather or festoon patterns. Handles, lugs and base rings were attached later. After the vessel was annealed, the core was broken out of the center. Unguent bottles of the 2nd and 1st millennia (Fig. 2 and Cover), as well as beads, (Fig. 6), were made in this way.

In a second technique the glass was cast in open or closed molds. Powdered or broken glass was either placed in a mold and heated until it melted, filling the available space, or hot glass was somehow forced into a mold. Once the mold was filled, the vessel or object was slowly cooled, enabling the glassmaker to remove the mold. Glass thus formed could then be finished by wheel or fire-polishing. The Hellenistic bowls in Figure 9 and the Astarte plaque in Figure 3 were made in molds using this technique.

A related technique is mosaic glass. Here, the glassmaker took rods or bundles of canes previously fused into patterns and cut them into thin discs which were laid inside a mold and held in place by an outer mold that fitted into it. The mold was then placed in the kiln to fuse the discs together. When cool, the molds were removed and the vessel could then be finished by wheel or fire-polishing to obtain an even, glossy surface. The rim was sometimes applied as a separate, twisted multicolored cane (Fig. 7). Several types of mosaic-glass were made in the Hellenistic and Roman periods including ribbon or striped glass, reticella or lace glass, marbled glass, and gold-band or color-band glass. Examples are illustrated in Figures 11 and 12.

At the beginning of the Christian era these techniques were replaced by the invention of glass blowing, employing a hollow metal blow-pipe. This discovery enabled glassmakers to manufacture free-blown and mold-blown vessels rapidly and cheaply for the first time. Most pieces in Toledo's collection are either free or mold-blown.

The colors of ancient glass depend on its chemical composition and on the manufacturing process. Most vessels fall into one of three groups; naturally-colored, colorless, or intentionally colored. The bluish-green or light green of the vast majority of pieces in the collection is caused by iron oxides in the sand. The Roman cinerary jar is an excellent example of such a naturally colored vessel (Fig. 18). Hellenistic bowls, such as those in Figure 9, are often naturally colored, but they occur in two shades, golden-brown or greenish-yellow, depending on the reduction or oxidation state of the glass while it was hot.

If manganese or antimony is added, the effect of the iron impurities is neutralized and a clear, colorless glass results. Such glass, like the examples in Figure 22, was much in demand during the Roman era.

Intentionally colored glassware has had chemical compounds added to produce a specific color. These colors may be translucent or opaque, and among these most common in antiquity were purple, blue, green, and yellow. Opaque white, yellow, red, blue, and green were also popular.

The iridescent gold and silver surfaces of much ancient glass was not originally intended; in fact, it is the result of devitrification of the glass caused by moisture. Since most intact ancient glasses are found buried in the ground, usually in tombs, cisterns or cesspools, water and soil acids have combined to destroy the surface. Over a long period they have caused the glass to "weather," to become severely pitted and to flake away. Although this iridescence is often prized by collectors, it was never intended by the ancient glassmakers. The Roman vessels from the Fayoum in Egypt (Fig. 31) are exceptional because they are in pristine condition, owing to the dry climate of that country.

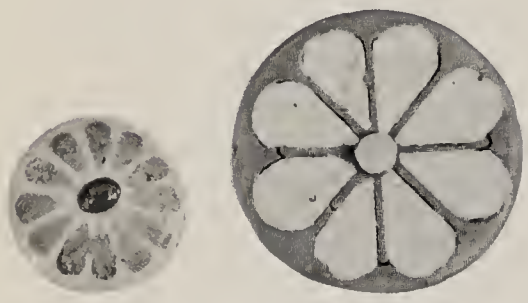

Figure 1. **Faience inlays,** Egyptian, 2nd millenium B.C. (left) Yellow, blue and red, Diam. ⅞ in. (2.2 cm), 25.677. (right) Blue-gray, white and yellow, probably from the Temple of Ramesses at Tell-el-Yahudiah, Dynasty XX, ca. 1175 B.C., Diam. 1⅜ in. (3.5 cm), 27.139.

Early Glass: 1600-1200 B.C.

Recent archaeological findings have shown that the glass industry was born in Mesopotamia during the 3rd millennium B.C., probably as the result of experimentation with pottery glazes and faience, a glass-like substance made principally of powdered quartz (Fig. 1). This industry produced beads and small objects made by tooling or casting glass. In the middle of the 2nd millennium, toward the close of the 16th century, the first glass vessels appeared in Mesopotamia, and shortly thereafter in Egypt, Northern Syria, Cyprus and the Aegean. Of these, the Egyptian vessels of the 18th and 19th Dynasties are the most numerous and best preserved, owing largely to the dry climate of that country. These vessels are mostly small core-formed bottles that held perfume or ointments and served as tomb gifts (Fig. 2). Their shapes imitated contemporary ceramic and stone vessels, while colors emulated lapis lazuli, faience or veined

stones such as agate. The preciousness of glass at this time is dramatically illustrated by its use as inlay in the sumptuous funerary mask of the young pharaoh Tutankhamen.

Other vessels came from glass workshops in Mesopotamia, Syria, and Cyprus. While these were also mostly formed on a core, a few were cast in open or closed molds. The mosaic glass technique was first used at this time, creating polychrome patterns as colorful as they were intricate. Other decorative objects also were produced by this early glass industry. Excavations at various sites in the Near East have yielded bright blue plaques or amulets relief-molded with figures of nude women (Fig. 3). As several of these plaques have been found in ruins of temples dedicated to the Near Eastern diety Astarte, they are thought to depict that goddess. Thousands of relief-molded beads and pendants also have been discovered in Mycenaean graves on the mainland of Greece (Fig. 4). These beads were used as jewelry or as clothing ornaments, and in one instance formed a diadem on the forehead of a dead warrior. The glass itself may have been imported from the Mesopotamian glass factories, then remelted and cast in open molds by Mycenaean craftsmen.

At the close of the 13th century this first flowering of the glass industry came to an abrupt end. The same calamities that brought about the collapse of the Minoan, Mycenaean and Hittite kingdoms, as well as the temporary eclipse of the Mesopotamian and Egyptian empires, also disrupted the luxury industries dependent on these palace cultures. Litte glass has been found at archaeological sites dated between 1200 and 900 B.C. As this Dark Age drew to a close in the 9th century, glassmaking resumed, and glass, though still a luxury commodity, appeared in many areas of the ancient world, even as far north as central Europe.

Figure 3. **Glass plaque of Astarte,** Eastern Mediterranean, possibly Syria, 14-13th century B.C., blue, H. 3 in. (7.6 cm), 23.195.

Figure 2. **Core-formed vessels,** Egyptian, New Kingdom, 18th Dynasty, first half of 14th century B.C. **Palm-leaf column bottle,** light blue with opaque white and yellow, H. 3¾ in. (9.6 cm), 67.2. **Amphoriskos,** turquoise blue with opaque white and yellow, H. 4⅞ in. (12.4 cm), 51.405. **Jar,** dark blue with opaque white, yellow and turquoise, H. 3-15/16 in. (10 cm), 35.55. **Palm-leaf column bottle,** dark blue with opaque white and yellow, H. 4⅜ in. (11.1 cm), 66.114.

Figure 4. **Cast beads,** Greece, Mycenaen, 14th-13th century B.C., blue, weathered opaque white, D. ⅞ in. (2.3 cm), 53.139A.

Early Glass: 900-300 B.C.

This revived industry produced glass vessels in an expanded range of shapes, colors and techniques. Core-formed bottles are found not only in Mesopotamia and Palestine, but also occur on Rhodes, Crete, and in Southern Italy, Etruria, and Carthage. A small blue bottle for which there is no known parallel may be a product of this industry (Fig. 5). Bowls cast by the lost-wax or a related technique were also made. One such bowl found in a royal tomb at Gordion in Phyrgia (Turkey) is of fine colorless glass engraved with a petal pattern. Other centers made mosaic glass vessels, or large, greenish unguent bottles cast in molds and finished on a lathe. In central Italy the Etruscans established their own glass works in the 8th-7th centuries, while in the Alpine region the Halstatt peoples produced small glass bowls and cups at about the same time. Of the Greek and Cretan workshops the most famous was the temporary factory of the renowned 5th century sculptor Pheidias which cast glass fleur-de-lys to decorate the robes of his colossal gold and ivory statue of Zeus at Olympia. Further east, elegantly cut bowls in flawless colorless glass appeared in lands controlled by the Persian Empire. Although these attractive wares have been associated with Achaemenid Persian workshops, their actual place of manufacture remains unclear.

The role of the Phoenicians in making glass and in trading glassware in this period is difficult to assess. While they are thought to have played a prominent role in the production and sale of glassware throughout the Mediterranean, the only objects attributed to their factories are glass inlays for ivories and furniture, and a delightful series of small head beads and pendants (Fig. 6). These beads were formed on a core or on metal rods; recent study suggests that many were made at the Phoenician city of Carthage in North Africa.

Figure 5. **Core-formed bottle,** Eastern Mediterranean, probably 8th-7th centuries B.C., blue, weathered opaque white, H. 3⅜ in. (8.6 cm), 61.39.

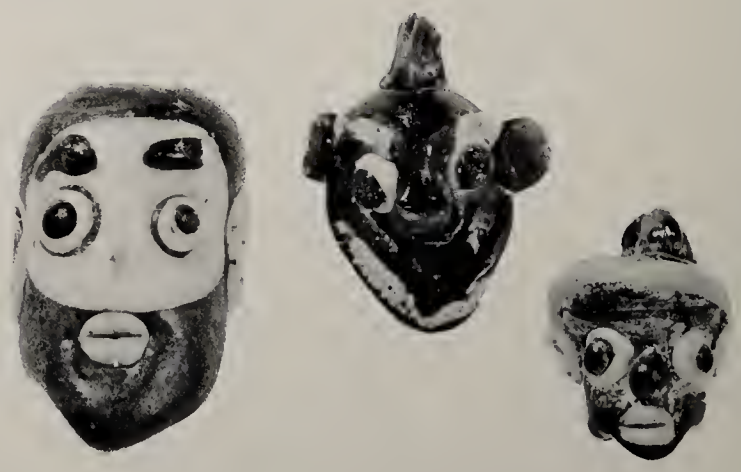

Figure 6. **Head beads,** Eastern Mediterranean, possibly Phoenician, 7th-2nd centuries B.C. **Male head,** opaque white with black hair and beard, black eyes, yellow lips, yellow earrings, H. 1-3/16 in. (3 cm), 76.57. **Demonic head,** dark blue with opaque white and opaque yellow. H. 1 in. (2.6 cm), 23.354A. **Negro head,** black with opaque white and opaque yellow, H. 13/16 in. (2 cm), 23.354D.

Hellenistic Glass: 300-50 B.C.

With the death of Alexander the Great in 323 and the subsequent establishment of the Hellenistic Kingdoms from his short-lived empire, there emerged a new era in glassmaking. The sophistication and wealth of the Hellenistic cities stimulated the market for luxury goods, and glassmakers along with gold and silversmiths prospered. Initially, the centers which manufactured core-made unguent bottles flooded the ancient world with their products. While the manufacturing techniques and colors resembled those of the second millennium industry, the shapes now mirrored the influence of Greek pottery. Miniature stamnoi, aryballoi, hydriai, alabastra and amphorae were widely exported wherever Greek merchants ventured (Cover).

The finest cast vessels of the 3rd to 1st centuries are usually attributed to the workshops of Alexandria in Ptolemaic Egypt. There, glassmakers produced superbly designed bowls of sandwich gold glass, ornate mosaic glass vessels, and a wide variety of richly colored and colorless bowls, plates and drinking cups. A hemispherical mosaic glass bowl with gold insets is a type associated with the Hellenistic industry of the late 3rd or 2nd centuries (Fig. 7). Inlays used to decorate furnish-

Figure 7. **Mosaic glass bowl,** Eastern Mediterranean, Hellenistic, probably 2nd century B.C., green ground with opaque yellow spirals, opaque yellow and gold glass rectangular insets, twisted coil and opaque white and blue applied as rim, D. 5-9/16 in. (14.1 cm), 67.10.

ings of all sorts are thought to have been made in Egypt and elsewhere. A vivid example is a box entirely formed of superimposed rows of colorful geometric glass inlay (Fig. 8). This fragmentary box was excavated at Seleucia on the Tigris in Mesopotamia by the joint Toledo Museum of Art-University of Michigan-Cleveland Museum of Art expedition to Iraq in 1927-32.

In the 2nd century the glass industry on the Syro-Palestinian coast developed a series of conical and hemispherical cast bowls (Fig. 9). Although restricted to a wealthier clientele, they represent the first form of glass tableware (as opposed to container glass) to be used widely. These vessels were cast in molds, wheel-polished on the inside and rim, and fire-polished outside. Horizontal wheel-cut grooves decorated the interior and, occasionally, the exterior. Contemporary or slightly earlier is a bluish-green bowl with vertical cut flutes and an engraved star pattern on the bottom (Fig. 10). Such bowls, evidently made at several locations, were exported throughout the Mediterranean.

Figure 8. **Box or object of glass inlay,** from Seleucia on the Tigris (Iraq), Hellenistic or Roman, 1st century B.C.,-1st century A.D., polychrome rods, opaque yellow, black, green, blue, opaque red and opaque white, longest rod 4¼ in. (10.7 cm), 31.118.

Figure 9. **Cast bowls,** Eastern Mediterranean, probably Syro-Palestinian, Hellenistic, 2nd-early 1st centuries B.C. **Conical Bowl,** greenish-yellow, D. 4⅝ in. (11.8 cm), 23.899. **Conical bowl,** colorless with yellow tinge, D. 6-3/32 in. (15.5 cm), 23.900. **Hemispherical bowl,** greenish-yellow, D. 5¾ in. (14.6 cm), 23.657.

Figure 10. **Cast fluted bowl,** Eastern Mediterranean, Hellenistic, late 3rd-2nd centuries B.C., light bluish-green, D. 4-9/16 in. (11.6 cm), 23.1071.

Figure 11. **Mosaic glass vessels,** Italy or Eastern Mediterranean, Hellenistic or Roman, late 1st century B.C.-early 1st century A.D. **Striped mosaic glass bowl,** green, opaque yellow, blue, opaque white and opaque red, twisted coil of opaque yellow and colorless glass applied as rim, D. 3-11/16 in. (9.4 cm), 68.87. **Color-band bottle,** purple, blue and opaque white, H. 5¼ in. (14.1 cm), 23.1488. **Gold-band bottle,** green, sandwich gold-glass, blue and golden-brown, H. 2¼ in. (5.7 cm), 67.9.

Figure 12. **Mosaic glass vessels,** Italy or Eastern Mediterranean, Hellenistic or Roman, late 1st century B.C.-early 1st century A.D. **Patella cup,** green ground with opaque yellow and opaque red, blue and white, D. 4 in. (10.1 cm), 23.1395. **Plate,** blue ground with opaque red and white, D. 6 in. (15.3 cm), 23.1397. **Patella cup,** dark blue, D. 2-11/16 in. (6.9 cm), 23.452.

Roman Glass: 50 B.C.-400 A.D.

During the 1st century B.C. the Hellenistic glassmaking centers fell progressively under Roman domination, the Syro-Palestinian region in 62 and Egypt in 30 B.C. Roman Italy also developed a glass industry during the 1st century, if not earlier; its products were similar to those from older eastern Mediterranean factories. Both areas seem to have made mold-cast monochrome and mosaic glass vessels, and to have experimented with new techniques, colors and shapes. The gold band and color band bottles and striped mosaic glass bowl in Figure 11, as well as the plate and two cups in Figure 12 are typical products of the period. More common were monochrome bowls, often in distinctive colors, with flat or slightly concave bottoms (Fig. 13). Some were ribbed, others plain, but both types were descended from the Hellenistic bowls (Fig. 9). These bowls are the last cast vessels commonly made by the Hellenistic or Roman industries.

Much more significant, however, was a technological breakthrough in the middle of the 1st century: the momentous discovery that glass could be blown. This invention revolutionized glassmaking. With a minimum of tools and effort craftsmen could now manufacture

Figure 13. **Cast bowls,** Italy or Eastern Mediterranean, Hellenistic or Roman, 1st century B.C.-1st century A.D. Bowl, golden brown, D. 4⅜ in. (11.1 cm), 23.504. **Ribbed bowl,** olive green, D. 5-5/16 in. (13.5 cm), 23.675. **Shallow bowl,** bluish-green, D. 5⅞ in. (14.9 cm), 23.501.

thousands of vessels in many shapes and sizes (Figs. 14 and 16), and do so quickly and inexpensively. What had been a luxury product suddenly became a commonplace. The cumbersome core technique and time-consuming casting methods disappeared altogether. The place of this discovery is not slated in ancient sources, though it is generally agreed the invention must have occurred in the glass centers on the Syro-Palestinian coast. With the new technology came the realization that glass might also be blown into molds which imparted both shape and decoration to the finished vessels, as the Roman beakers, cup and jug in Figure 15 eloquently demonstrate. Somewhat later in date are the delightful head flasks of Figure 19, and the sprinkler and flasks in Figure 20.

The new products of free and mold-blowing included both tableware and containers. Tableware was produced in countless shapes, both decorated and undecorated. Initially, much of it was brightly colored (Fig. 14), but the bulk of utilitarian wares that served ordinary purposes was left naturally colored, either bluish-green

Figure 15. **Early mold-blown vessels,** Italy or Eastern Mediterranean, Roman, 1st century A.D. **Beaker,** greenish-blue, H. 5-11/16 in. (14.5 cm), 23.912. **Jug,** dark blue, H. 3-13/16 in. (9.7 cm), 23.482. **Beaker,** pale yellow, H. 8-1/16 in. (20.5 cm), 23.490. **Cup,** pale yellow, Greek inscription: "Rejoice that you have come." D. 2¾ in. (6.8 cm), 67.6.

Figure 14. **Early blown vessels with applied decoration,** Italy or Eastern Mediterranean, Roman, early 1st century A.D. **Cup,** golden-brown with opaque yellow, red and light blue decoration, D. 3¼ in. (8.3 cm), 51.376. **Jug,** blue with opaque yellow, white and red decoration, H. 8-3/16 in. (20.8 cm), 23.1500. **Jar,** purple with opaque white and blue decoration, H. 4-1/16 in. (10.3 cm), 23.1496. **Jar,** light purple with opaque white and blue decoration, H. 4-15/16 in. (12.5 cm), 23.1495.

Figure 16. **Blown tableware,** Eastern Mediterranean, probably Syro-Palestinian, Roman, 1st-4th centuries A.D. **Jug,** pale brown, H. 7-11/16 in. (19.6 cm), 23.984. **Beaker,** yellowish-green, H. 3½ in. (8.8 cm), 23.839. **Plate,** yellowish-green, D. 9¼ in. (23.2 cm), 23.880. **Modiolus,** light green, H. 4¼ in. (10.8 cm), 23.947.

Figure 17. **Mold-blown bottles,** France and Eastern Mediterranean, Roman, late -st-3rd centuries A.D. **Cylindrical bottle,** greenish-blue, Latin inscription "Frontiniana" imperfectly molded on bottom, from Roman Gaul, H. 8¾ in. (22.2 cm), 48.220. **Cylindrical bottle,** greenish-blue, H. 15 in. (38 cm), 16.77. **Four-sided bottle,** light green, H. 7⅛ in (18.1 cm), 23.565. **Eight-sided bottle,** light green, H. 10¼ in. (26 cm), 65.177.

or yellowish-green (Fig. 16). Shapes partly imitated pottery or metal prototypes. In several instances age-old pottery traditions were replaced by glass. This occurred not only because glass could be more easily cleaned and was impervious to oil and other liquids, but because it was transparent, or at least translucent. The novelty of transparency cannot be underestimated in accounting for the immediate popularity of blown glass. These advantages also made glass eminently suitable for the storage, preservation, transportation, display and merchandising of other substances. To that end, the Romans invented the prismatic bottle (Fig. 17). These bottles were blown into two or three part molds and often carry a geometric pattern or inscription on the bottom. Some were cylindrical, such as the example in Figure 17 with the inscription of the Gallo-Roman glassmaker Frontinus. Others were blown in prismatic molds with as few as three or as many as thirteen sides. These bottles, widely popular in the 1st and 2nd centuries A.D., are the ancestors of modern glass containers.

Another popular container was the lidded storage jar (Fig. 18). These jars were the largest free-blown vessels commonly manufactured by the Roman industry. Their pleasing proportions and symmetry make them one of the most elegant shapes achieved in antiquity. Such jars served many functions, and in the last 1st and 2nd

Figure 18. **Cinerary jar and lid,** reported to be from Krefeld-Gellup, Germany, Roman, late 1st-2nd centuries A.D., bluish-green, H. 12⅝ in. (32 cm), 77.14.

centuries they were frequently used as cinerary urns to hold the ashes of the dead. The jar shown here once contained the remains of a resident of Roman Germany.

Roman workshops also produced many types of decorated glass vessels. One of the most common decorating techniques involved the application of flecks, blobs or trails of glass. Such decoration might be as simple as the splashed vessels of the 1st century A.D. (Fig. 14), as intricate as the snake-thread sprinkler of the 2nd or 3rd century (Fig. 21), or as imaginative as the baroque fantasies of the Roman Syrian glassmakers of the 4th-6th centuries (Fig. 28). Another common technique employed tooled indentations. The small beaker in Figure 16 and the unusual flask in Figure 22 are both decorated in this manner. A technically puzzling piece is the flask in Figure 30. Narrow tubes, pushed in from the vessel wall reach from the body to the neck.

The art of facet-cutting or engraving was aesthetically more sophisticated. In the early Empire the gemcutters' skills were applied to produce exquisitely carved cameo glass. Ornamental designs, mythological scenes and portraits were cut in relief on two or more superimposed,

Figure 19. **Mold-blown head flasks**, Eastern Mediterranean, Roman, 2nd-3rd centuries A.D. **Double head flask**, dark green, H. 3¼ in. (8.2 cm), 23.1224. **Double head flask**, colorless with purple streaks, H. 5¼ in. (13.5 cm), 23.428. **Head flask**, colorless, Greek inscription on neck: "It surpasses (all)." D. 3-7/16 in. (8.8 cm), 23.414. **Head flask**, purple, H. 3¾ in. (9.5 cm), 23.457. **Head flask**, colorless, H. 4½ in. (11.4 cm), 67.8.

Figure 20. **Mold-blown vessels,** Eastern Mediterranean, Roman, 2nd-4th centuries A.D. **Grape flask,** light yellow, H. 3¾ in. (9.5 cm), 23.678. **Flask,** colorless, H. 5½ in. (14 cm), 23.1085. **Sprinkler flask,** light green, H. 2¾ in. (7 cm), 23.1134.

Figure 21. **Snake thread sprinkler flask,** probably Syro-Palestinian, Roman, late 2nd-3rd centuries A.D., colorless (greenish), H. 3⅜ in. (8.6 cm), 51.374.

Figure 23. **Cameo glass theatrical mask,** Roman, 1st century A.D., opaque white and dark brown on a dark brown background with attached gold metal hairband, H. 1-9/16 in. (4 cm), 23.1641.

Figure 24. **Facet-cut bowl,** Eastern Mediterranean, probably Sassanian, 3rd-7th centuries A.D., colorless, D. 3-7/16 in. (8.8 cm), 62.26.

Figure 22. **Colorless vessels,** Roman, late 1st-3rd centuries A.D. Flask, probably from Roman Ger many, H. 4½ in. (11.4 cm), 23.1345. **Plate,** Eastern Mediterranean, cut rosettes on bottom, D. 7¼ in. (18.4 cm), 48.15. **Small bowl,** Italy or Eastern Mediterranean, D. 3-7/16 in. (8.8 cm), 23.1385. **Beaker,** Italy or Eastern Mediterranean, cut decoration, H. 4 in. (10.2 cm), 23.1073.

blown layers of colored glass. The medallion illustrated here dates to the Julio-Claudian or Flavian period (Fig. 23). About the same time facet-cut vessels became popular; the conical beaker (Fig. 22) with oval cut bosses is an unique variant of the more common type of facet-cut beaker. The influence of this technique was also felt beyond the borders of the Empire, for the Sassanian Persians of western Asia produced beakers and bowls decorated with rows of wheel-cut facets comparable to the one in Figure 24.

In the 3rd and 4th centuries A.D. several schools of glass engraving developed in Italy, Egypt and in Roman Germany. The products of the German glasshouses centered at Cologne were especially fine, and two outstanding examples are to be found in Toledo's collection. The earlier, probably dating to the 3rd century, is a beaker found in the Rhineland. The outside of the beaker is wheel-engraved with a mythological scene set against an urban landscape (Fig. 25). The figures are perhaps Venus and Cupid. On the other beaker, a smaller vessel of the 4th century, is cut a Christian theme (Fig. 25). Here, the engraver has depicted four figures illustrating at least two Biblican stories: Moses striking the rock and Christ raising Lazarus from the dead.

Other decorative techniques involved painting, enamelling or gilding the surface of vessels, and related to

Figure 25. **Wheel-engraved beakers,** Roman Germany, probably Cologne, Roman, mid-3rd-4th centuries A.D. **Beaker,** colorless, from Worringen near Cologne, H. 8 in. (20.3 cm), 30.6. **Beaker,** colorless, H. 4-7/16 in. (11.3 cm), 48.14.

these was the sandwich gold-glass process. In the 3rd and 4th centuries A.D. this technique, first seen in the Hellenistic period, was revived to produce vessels and medallions. Portraits, pagan mythological scenes, genre subjects, and Christian and Jewish themes were etched in gold leaf, often with painted details. The gold leaf was laminated between two layers of glass. The jagged edged medallions with Christian scenes appeared to have been purposely broken away from the bottom of vessels and used to mark individual graves in the catacombs of Rome. The two superb gold-glass plaques in Toledo's collection illustrate both religious and secular subjects (Figs. 26 and 27).

The Roman glass industry expanded enormously after the invention of glassblowing in the 1st century B.C. By the middle of the next century glasshouses existed in every province of the Roman Empire, and glassware and glassmakers circulated widely. In the 1st century A.D. much of the better glassware was brightly colored purple, blue, green and yellow. It also was remarkably uniform throughout the Roman world. In the late 1st and 2nd centuries colored glass ceased to be made and was supplanted by a fashion for fine, colorless glass such as that shown in Figure 22. This fashion, in turn, was displaced in the 4th-6th centuries by lightly colored glass-

Figure 27. **Gold-glass medallion,** Italy, probably Rome, 350-400 A.D., colorless with gold-leaf; honors Vincentius, a winning charioteer; **Invictus** (unconquerable), the name of the horse, is incised in the gold beneath the man's feet; red painted decoration on tunic and bridle identifies the team's color; D. 2½ in. (6.4 cm), 67.11.

Figure 26. **Gold-glass medallion,** probably from Rome, 4th century A.D., colorless with gold-leaf, Christ with Saints Peter and Paul, Latin inscription: "The Lord gives the law.", largest dimension 4⅞ in. (12.4 cm), 67.12.

Figure 28. **Vessels with applied decoration,** Syro-Palestinian, late Roman, 4th-5th centuries A.D. Basket, colorless (greenish) with turquoise blue decoration, H. 9¾ in. (24.8 cm), 23.1211. **Jar,** colorless (greenish) with purple decoration, H. 4½ in. (11.5 cm), 23.1061. **Flask,** colorless with dark greenish-blue decoration, H. 11-9/16 in. (29.4 cm), 23.1063.

Figure 29. **Flask with glass bells**, Syro-Palestinian, late Roman or Byzantine, 6th century A.D., colorless (greenish) with dark bluish-green bells and decoration, H. 7⅜ in. (18.8 cm), 23.1064.

Figure 30. **Flask with internal threads**, Syro-Palestinian, late Roman or Byzantine, 6th century A.D., colorless (greenish), H. 8 in. (20.3 cm), 23.534.

ware; pale greens, yellows, and browns (Figs. 29 and 32). At the same time, the political and economic instability of the Late Empire led to the development of distinct regional schools of glass production, with a fairly clear division between the products of the eastern and western Mediterranean. The ornate glass of Syria and Palestine (Figs. 28, 29 and 30) contrasts strongly in shape and decoration with engraved pieces from the Rhineland (Fig. 25), or with the elegantly functional tableware of 4th-6th century Egypt (Fig. 31).

With the collapse of the Roman Empire in Italy and in the western Mediterranean during the 5th-6th centuries, most of the glass factories of Europe ceased production, and glassmaking, along with all of the arts, was seriously affected. The repertoire of shapes sharply decreased, and the sophistication and variety of decoration markedly declined. Characteristic pieces from 7th century Europe are the palm cup and spindle whorl recovered from a Frankish cemetery in Germany (Fig. 32).

In the eastern Mediterranean the Roman world remained intact, becoming what is now called the Byzantine Empire ruled from Constantinople. Byzantine glassmakers continued Roman traditions with little change.

Figure 31. **Roman-Egytian vessels,** Karanis and the Fayoum, late Roman or Coptic, 4th-6th centuries A.D. **Conical lamp,** olive green with blue decoration, H. 6-7/16 in. (16.3 cm), 77.17. **Conical lamp,** light yellow, H. 4⅞ in. (12.4 cm), 77.18. **Dish,** light yellow, D. 5⅞ in. (15 cm), 77.16. **Collared flask,** light green, H. 9-3/16 in. (23.4 cm), 77.19. **Oval dish,** light yellow, D. 6⅜ in. (16.2 cm), 77.15.

Hexagonal mold-blown jars and bottles with Christian and Jewish emblems are typical examples of Byzantine craftsmanship (Fig. 33). This industry came to an end only when the armies of Islam conquered the Near East and North Africa in the 7th and succeeding centuries. By the 8th century a purely Islamic decorative style emerged; with it, arose a new glassmaking tradition which marked the end of the ancient glass industry.

David Grose

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Figure 32. **Frankish glass,** from Bingen, Germany, late 6th-7th centuries A.D. **Palm cup,** light green, D. 4⅜ in. (11 cm), 77.11. **Spindle whorl** (?), dark green (appearing black) with opaque white, D. 1½ in. (4 cm), Gift of Gawain McKinley, 77.20.

Figure 33. **Mold-blown Byzantine vessels,** Syro-Palestinian, possibly Jerusalem, 6th-early 7th centuries A.D. **Hexagonal jug with cross motif,** light yellow with green handle, H. 7¾ in. (19.7 cm), 48.13. **Hexagonal jar with Jewish menorah,** brown, H. 3-3/16 in. (8.6 cm), 23.1359.

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